C6 cont.

35. (New Claim) The article of claim 14 in the form of a film, sheet, pipe, an extruded article, a molded article, a molded container or bottle, wherein the article has a haze which is at least about 4 percent lower than that of an article formed from a nanocomposite having unpurified clay therein.

Remarks

Claims 1, and 3-10, 12-14, 18-19, 22, 30-35 are pending in the application. Applicant has canceled claims 11, 15-17, 20-21, 23-29 and added new claims 32-35. Support for new claims 32 and 33, relating to particular organic cations, may be found in the specification on pages 22-24. Support for new claims 34 and 35 may be found in claims 15-17 as originally filed. No new matter is introduced by this amendment.

A. Claim Rejections for Indefiniteness Under 35 U.S.C. §112

Applicants thank the Examiner for withdrawal of the rejections under 35 USC 112(2) for indefiniteness with respect to the Markush language.

B. Rejections Under 35 U.S.C. §102

Applicants thank the Examiner for withdrawal of the rejections of claims 1-2, 5-8, 10-12, and 14-17 for anticipation over Pinnavaia (U.S. Pat. No. 6,017,632).

C. Rejections Under 35 U.S.C. §103

The Examiner rejected claims 1-2, 5-8, 10-12, and 14-17 under 35 U.S.C. § 103(a) as allegedly being obvious over Pinnavaia (U.S. Patent No. 6,017,632) in view of Clarey (U.S. Patent No. 6,050,509). The Examiner further rejected claims 3-4, 13-14, 18, and 22-30 as allegedly being obvious over Pinnavaia and/or Clarey, in view of Beal (U.S. Patent No. 5,552,469), and she further rejected claim 9 as allegedly being obvious over Pinnavaia, Clarey, and/or Beal, further in view of Maxfield (WO 94/11430). Applicants respectfully traverse these rejections.

What is why this is now a 103 rejection?

In rejecting the claims, the Examiner appears to have selected individual components from among the various references, from various sections of the disclosures, from various disparate embodiments, and/or from large genuses, as needed to match the individual elements of Applicants' claims. Applicants respectfully submit that the Examiner has failed to provide adequate motivation for the selection of the particular combination of components.

As the Examiner is aware, in order to establish a *prima facie* case of obviousness, the art of record must teach or at least suggest the particular combination of elements described in the

invention as a whole. It is well established that a rejection may not be based on merely locating the individual elements of an Applicants' invention somewhere in the prior art. Rather, there must be some motivation, suggestion, or teaching of the desirability of making the specific combination that was made by the applicant. Furthermore, there must be a motivation or suggestion for each selection and/or modification required to combine the elements of the claims from the prior art. *See Yamanouchi Pharmaceutical v. Danbury Pharmaceutical,* 231 F.3d 1339, 1343-1345, 56 U.S.P.Q.2d 1649 (Fed Cir. 2000).

Obviousness Rejections Over Pinnavaia In View of Clarey

Claims 1-2, 5-8, 10-12, and 14-17 have been rejected as allegedly being obvious over Pinnavaia in view of Clarey.

Pinnavaia's invention and focus relates to the intercalation of clays (in their acidic form) with certain electrically neutral, organic, and basic "curing" agents, and the subsequent reactions of those intercalated clays with monomers to initiate polymerization/curing, to produce a large genus of nanocomposites comprising "cured" thermoset polymers, such as polyurethanes, polyureas, polysiloxanes, and alkyds *(see* column 10, lines 23-3 6). In a single paragraph in column 11, Pinnavaia also states that "All thermoplastic polymers can benefit from the disclosed technology." Pinnavaia then enumerates a list of 19 large genuses of thermoplastic polymers to which his clay/intercalated curing agent technology, might apply, of which one subgenus is the polyamides recited by Applicants' pending claims.

So it does teach PA after all

The Office Action relies on Pinnavaia's reference to "technology" to provide motivation to (1) select the polyamides from the Markush group of thermoplastic polymers *(see* the Office Action's response items c and g), and (2) combine it with a single sentence from Example E2 regarding sedimentation of a clay sample to "remove" quartz *(see* the Office Action's response items a and d).

The "technology" of Pinnavaia relates to the intercalation of an acidic clay with a basic organic curing agent. The curing agents aid exfoliation of the clay, and can initiate polymerization of the preferred class of thermoset polymers, as described by Pinnavaia at length. The overwhelming bulk of the specification, including the examples to be discussed later, focus on the curing agent/clay/thermoset polymer "technology." As an "alternative" sidelight in column 11, Pinnavaia also suggested his clay/intercalated curing agent "technology" might be useful with respect to thermoplastic polymers "wherein the polymer melt may bind by

entanglement," even though such pre-polymerized thermoplastic polymers would not benefit from the "curing" activity. Applicants maintain that Pinnavaia's mere reference to "technology" can be reasonably construed as either a reference to, or a teaching or motivation to select and combine, (1) the polyamides selected from the Markush group of thermoplastic polymers, with (2) the single sentence from Example E2 regarding "The Na+ montmorillonite [was] purified by sedimentation to remove quartz and other dense, large grain contaminants."

First, the Examiner has not identified a sufficiently specific motivation to select polyamides from among the large genuses of thermoset and thermoplastic polymers disclosed by Pinnavaia. A mere reference to "technology" in this alternative embodiment does not justify a selection of polyamides from among all the thermoset polymers from among the 19 enumerated classes of thermoplastic polymers. The Examiner has identified no other reasonable motivation for the selection of polyamides, from Pinnavaia or any other source.

The "removal of quartz" from clays is mentioned nowhere in Pinnavaia except Example E2. Example E2 describes an unsuccessful attempt to prepare a nanocomposite via Pinnavaia's "technology" from an Na+ montmorillonite clay, in which "There was no observable intercalation of the clay by the curing agent and epoxy resin." Example E2 does mention, in a single sentence, removal of quartz. The relevant sentence reads, "The Na+ montmorillonite was purified by sedimentation to remove quartz and other dense, large grain contaminants."

The Examiner asserts in comments "a" and "d" that quartz was "removed completely" or "eliminated" from the clay. Applicants maintain that the term "removal" merely implies that some quartz was separated from the clay. The only process mentioned in Pinnavaia was sedimentation, "to remove quartz and other dense, large grain contaminants." One of ordinary skill could not reasonably infer from this sentence that sedimentation "completely" removed or "eliminated" even "small" grains of quartz, or that any particular percentage of quartz removal was or will always be obtained, especially in view of the highly variable compositions of natural clay samples. Moreover, none of the other references cited by the Examiner (including Clarey) assert that all quartz is removable from clays. Moreover, Example E2 was unsuccessful in its attempt to employ Pinnavaia's curing agent "technology," which would tend to lead one of ordinary skill away from attempting to apply its teachings to the present invention.

In Example E3, a "purified" Na+ montmorillonite clay was treated with NH_4^+ cations, which were then intentionally thermally decomposed to produce an acidic form of the clay, then

the clay was used in Example E4 to prepare "a conventional clay-epoxy composite." In Example E5, an example of an epoxy nanocomposite was prepared using the Pinnavaia "curing agent" technology and was compared with an epoxy-clay nanocomposite prepared from an Na+ montmorillonite clay that had been intercalated with alkyl ammonium ions. There is no indication in Example E5 as to whether or not the clays were "purified," and it is noted that the presence of the alkyl ammonium in clay gallery of the comparative sample "decreased the effectiveness of the clay reinforcement."

Applicants' maintain that one of ordinary skill in the art would not read this sequence of examples and interpret them as teaching or suggesting the importance of "removal of quartz," or that "complete removal of quartz" was a significant part of Pinnavaia's "technology." Moreover, this sequence of examples provides no suggestion or motivation to modify Pinnavaia's examples or technology to achieve any particular low total concentration of quartz such as the "less than about 2% by weight of quartz" recited by Applicants' claims, especially in view of the negative results obtained in Examples E2 for the Na+ montmorillonite clay nanocomposite, and the alkyl ammonium ion intercalated clay of Example E5. Accordingly, Applicants respectfully submit that Pinnavaia does not represent the teachings purported by the Examiner.

Applicants' previous response pointed out that while Clarey discloses removal of generic impurities to the various particular levels, Clarey provides no specific teachings regarding the quantities of quartz impurities. The Examiner's rejections rely on combining Clarey with Pinnavaia to provide Applicants' claim limitations regarding "less than about 2% by weight of quartz." Clarey describes a method for purifying clays for use in nanocomposite applications to remove a variety of impurities. Although Clarey suggests that any clay can be purified, at column 3, line 60 through column 4 line 11 Clarey specifically remarks on the problems encountered in attempts to apply his purification methods to Na+ montmorillonite clays, and suggests such clays be converted to Ca^{2+} clays prior to purification by his method. Thus, one of ordinary skill in the art would have little, or perhaps even negative motivation with respect to the prospect of applying Clarey to modify the disclosures of Pinnavaia's examples, regarding Na+ montmorillonite clays, which themselves contain negative motivations, as described above.

The Examiner points to U.S. Patent No. 6,337,046 to Bagrodia, and U.S. Patent No. 6,090,734 to Tipursky as support for the effects of specific levels of "impurities" on haze and other properties. Tipursky does teach that amorphous silica negatively impacts haze and gas

permeability. Nevertheless, neither Bagrodia nor Tipursky specifically teach that quartz at any particular concentration impacts haze and gas permeability. Applicants' claims have not been rejected over either of those references. because it was support for my allegation stupid

Moreover, even if one or more of Clarey, Bagrodia, and/or Tipursky were properly combinable with Pinnavaia, which Applicants maintain they are not, and they taught relevant specific percentages of quartz, which they do not, Clarey, and/or Tipursky have no relevant teachings regarding polymers. Bagrodia teaches polyester nanocomposites, but does not teach or suggest that polyamides be employed. Therefore, none of Clarey, Bagrodia, and/or Tipursky remedies the failure of Pinnavaia to provide a basis for selecting polyamides from the large number of polymers disclosed in Pinnavaia, nor do they suggest a basis for modifying the Examples E2-E6 to discard the explicitly recited epoxy polymers, and substitute polyamides. do not bother arguing

Obviousness Rejections Over Pinnavaia and Clarey, over Beall

The Examiner rejected claims 3-4, 13-14, 18, and 22-30 as being obvious in light of Pinnavaia and/or Clarey, in view of Beall. The Examiner asserts in item "i" on page 9 that Pinnavaia teaches polyamides, that polyamides "contain appropriate monomeric components" that are known to those of skill in the art as applicable to nanocomposites, that Beall "teaches polyamides more specifically," and that these observations establish a *prima facie* case of obviousness. Applicants respectfully traverse this rejection.

Applicants do not deny that both Pinnavaia and Beall disclose polyamides in the context of nanocomposites, or that those of ordinary skill in the art are aware of "appropriate monomeric components" for making polyamides. Nevertheless, Applicants re-iterate that merely identifying the individual elements of Applicants' claims in one or more references, or in the knowledge of one of ordinary skill in the art, is legally insufficient to establish a *prima facie* case of obviousness. The Office Action must specifically identify and support with objective evidence a teaching, motivation, or suggestion to select and combine the references. *See In re Kotzab*, cited above. yes it is

→ that would be a 102 rejection

In item "i" on page 9, and in item "h" on page 8, the Office Action attempts to rely on the knowledge of one of ordinary skill in the art to provide motivation to combine Beall and/or Cleary with the other references. MPEP §2144 permits the Office to rely on "common knowledge in the art," "implicit disclosures," and/or "scientific principals" to establish a *prima facie* case of obviousness. In view of Applicants' discussion of the technical teachings of the

references, Applicants maintain that the Examiner has not adequately identified or defined motivation or specific and convincing reasoning or knowledge in the art for combining the three references, nor for selecting the individual elements of Applicants' claims from any of the three references. Accordingly, Applicants respectfully request withdrawal of this ground of rejection.

Rejections Over Pinnavaia, Clarey, and Beau in View of Maxfield

Claim *9* is finally rejected under 35 USC 103(a) as allegedly being obvious over Pinnavaia, Clarey, and/or Beall, in view of Maxfield (WO 94/11430). Applicants maintain that this combination of references does no more than identify some of Applicants' claim elements in Maxfield. As previously stated, the mere identification of the various technical features of the claims in one or more references does not provide legally sufficient motivation to select the specific combination of the features of claim *9* from the four references. There being no motivation to combine these references, Applicants respectfully traverse this ground of rejection.

Overall, a showing that Pinnavaia, Clarey, Beall, and/or Maxfield renders Applicants' amended claims obvious would require the Examiner to at least show, and support with objective evidence, that one of ordinary skill in the art would have motivation to select and combine, from the whole disclosure of Pinnavaia, in view of the other references (1) the sentence from Pinnavaia's Example E2 regarding sedimentation of clay, (2) modify the sedimentation mentioned by Pinnavaia to provide Applicants' limitation to "less than 2% quartz, (3) modify the epoxy polymers utilized in Examples E3-E6, and/or the general set of thermoset polymers emphasized by Pinnavaia, to employ (4) a specific selection of a polyamide from among the 19 classes of thermoplastic polymers. To produce a valid *prima facie* rejection for obviousness, there would need to be motivation or suggestion from some source for each of these selections and/or modifications. Motivation has not been shown for each of these selections, thus a rejection over the combination is insufficiently supported.

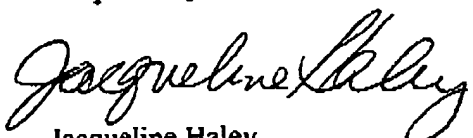
Applicants' dependent claims 8 and 13, and new claims 32 and 33 also require the clays of the nanocomposites to be treated with an organic cation. Applicants previously argued that Pinnavaia taught away from the use of organic cations, based on the disclosures at column 4, line 62 through column *5* line 7, and the comparative sample prepared from an alkyl ammonium ion exchanged clay cited in Example E5 at column 20, lines 51-61. Applicants have also argued that the treatment of clays with NH_4^+ ions disclosed in Example E3 is irrelevant, because the NH_4^+ cations are not organic, and moreover they are intentionally thermally decomposed in the

example to produce an acidic clay having a 10.5 A spacing. The Examiner discounted Applicants' argument that Pinnavaia teaches away from the use of organic cations, because cations such as ammonium cations exchange with clays. Applicants do not deny that NH_4^+ ions and alkyl ammonium ions intercalate clays. However, that does not change the fact that Pinnavaia teaches away from the use of organic and/or alkyl ammonium ions in his nanocomposites. *See* Example E5. The Examiner must consider Pinnavaia's teaching away from the use of organic cations when considering the obviousness of Applicants' claims 8, 13, 32, and 33.

CONCLUSION

Pursuant to the above amendments and remarks, Applicants request allowance of all pending claims.

Respectfully submitted,



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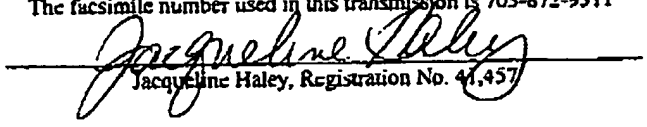

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Marked Up Copy f Amended Claims

7. (Once Amended) The nanocomposite of claim 1, wherein the layered clay material comprises montmorillonite, hectorite, mica, vermiculite, bentonite, nontronite, beidellite, volkonskoite, saponite, magadite, kenyaite, or a mixture thereof, wherein the layered clay materially is optionally treated with an organic cation.

8. (Twice Amended) The nanocomposite of claim 1, wherein the layered clay material comprises organic cation-treated sodium montmorillonite or organic cation-treated sodium bentonite [that has been treated with an organic cation].

9. (Once Amended) The nanocomposite of claim 1, wherein at least about 50 percent of the layered clay material is dispersed in the form of individual platelet particles and tactoids in the matrix polymer and the individual platelet particles have a thickness of less than about 2 nm and a diameter of from about 10 to about 3000 nm.

10. (Once Amended) The nanocomposite of claim 1, wherein the layered clay material has less than about 1.0 % by weight of quartz particles.

12. (Once Amended) The nanocomposite of claim [11] 7, wherein the organic cation is derived from ammonium salt compound.

13. (Twice Amended) The nanocomposite of claim 1, wherein the melt-processible matrix polymer comprises poly(*m*-xylylene adipamide) or a copolymer thereof, and the clay material comprises organic cation-treated sodium montmorillonite or organic cation-treated sodium bentonite [that has been treated with an organic cation].